

Atty. Dkt. 176-98
PE-25195-AM

U.S. PATENT APPLICATION

Inventor(s): Yen-Kun CHEN

Invention: SECURITY REVOLVING DOOR ASSEMBLY

*NIXON & VANDERHYE P.C.
ATTORNEYS AT LAW
1100 NORTH GLEBE ROAD, 8TH FLOOR
ARLINGTON, VIRGINIA 22201-4714
(703) 816-4000
Facsimile (703) 816-4100*

SPECIFICATION

797555

SECURITY REVOLVING DOOR ASSEMBLY**BACKGROUND OF THE INVENTION****1. Field of the Invention**

The invention relates to a revolving door assembly,
5 more particularly to a security revolving door assembly.

2. Description of the Related Art

Banks, jewelry stores, and other places of business
are mostly equipped with different safety precautions
against robberies and holdups. For example, when a robber
10 robs a bank and intends to escape through an automatic
or a revolving door of the bank, a bank employee can
control and stop movement of the door so as to block
exit passage of the robber from the premise, thereby
facilitating capture of the robber.

15 Although the design of the aforementioned door can
restrict the robber within the premise, the robber is
not isolated from other people in the premise so that
a hostage drama or injury to other people often occurs.

SUMMARY OF THE INVENTION

20 Therefore, the object of the present invention is
to provide a security revolving door assembly that is
capable of overcoming the aforementioned drawbacks of
the prior art.

25 According to this invention, a security revolving
door assembly comprises a revolving door and a
controlling unit. The revolving door has a rotary
vertical shaft, a vertical lateral wall with an

arc-shaped cross-section and extending circumferentially relative to the vertical shaft, and a plurality of door wings mounted on and extending radially from the shaft toward the lateral wall. The 5 door wings have distal ends disposed away from the shaft, and include a first door wing and a second door wing following the first door wing. The door wings are rotatable along with the shaft, and define with the lateral wall a trap space when the first and second door 10 wings reach respectively first and second positions which are spaced apart angularly. The second position lags the first position. The distal ends of the first and second door wings confront the lateral wall when the first and second door wings reach respectively the 15 first and second positions. The controlling unit is coupled to the revolving door and is operable so as to stop rotation of the door wings as soon as the door wings define the trap space.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

25 Figure 1 is a perspective view of the preferred embodiment of a security revolving door assembly according to the present invention;

Figure 2 is a top sectional view of the preferred

embodiment;

Figure 3 is a fragmentary side sectional view of the preferred embodiment;

5 Figure 4 is a view substantially similar to that of Figure 3, illustrating a second plunger moving away from a first plunger when a second electromagnetic device is energized;

10 Figure 5 is a view substantially similar to that of Figure 2, illustrating how a passerby is trapped when first and second door wings are located at first and second positions respectively; and

Figure 6 is a view substantially similar to that of Figure 4, illustrating how a first engaging portion engages a second engaging portion.

15 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to Figures 1 to 6, the preferred embodiment of a security revolving door assembly 100 according to the present invention is shown to comprise a revolving door 1, a stationary seat 14, and a controlling unit.

20 The security revolving door assembly 100 is adapted to be applied in banks, jewelry stores, hi-class dress shops, art museums, or other places that require security against robbery.

25 The revolving door 1 is substantially similar to other currently available revolving doors, and has a rotary vertical shaft 11 with a bottom portion journaled to the ground of a gate 200 in a conventional manner, two

opposite vertical lateral walls 13, each of which has an arc-shaped cross-section and extends circumferentially relative to the vertical shaft 11, and a plurality of door wings 12 mounted on and extending 5 radially from the shaft 11 toward the lateral walls 13. The lateral walls 13 are connected to and are disposed between two outer walls 201 of the gate 200. The revolving door 1 has an entrance side 151 and an exit side 152 opposite to the entrance side 151.

10 The door wings 12 are equiangularly spaced apart about the shaft 11, and have distal ends disposed away from the shaft 11. The door wings 12 are rotatable along with the shaft 11, and define with each lateral wall 13 a trap space 161, 162 (see Figures 1 and 5) when a successive 15 pair of door wings 12, for instance, first and second door wings specifically designated at 12', 12" in Figures 1 and 5, reach respectively first and second positions (1P, 2P) (see Figure 5), which are spaced apart angularly. The second position (2P) lags the first position (1P) 20 along a counterclockwise direction. In this situation, the distal ends of the first and second door wings 12', 12" confront the lateral walls 13 at two ends 131, 132 (see Figure 5) of one of the lateral walls 13 so that a passerby 5 can be trapped within the trap space 162.

25 In this embodiment, the revolving door 1 has four door wings 12, each of which forms an angle of 90° with an adjacent door wing 12. Each door wing 12 includes

a rectangular metal frame 121 (see Figure 1), and a bullet-proof glass 122 (see Figure 1) fitted within the metal frame 121 and capable of protection against an applied destructive force.

5 The stationary seat 14 (see Figures 1, 2 and 3) is disposed above the door wings 12, and includes an annular frame 141 mounted fixedly on top ends of the lateral walls 13, a cross frame 142 fitted within the annular frame 141, a bearing unit 143 disposed at the center 10 of the cross frame 142 and sleeved on a top portion of the vertical shaft 11, and a top cover 144 covering detachably the annular frame 141 and the cross frame 142. A round top plate 145 is connected to a top end 15 of each door wing 12, and is rotatable along with the door wings 12. The cross frame 142 has ends 1421 offset from the two ends 131, 132 of the lateral walls 13 by a lagging angle along a counterclockwise direction. A gap is formed between the cross frame 142 and the top plate 145 so that the cross frame 142 is not in direct 20 contact with the top plate 145.

The controlling unit is coupled to the revolving door 1 and is operable so as to stop rotation of the door wings 12 as soon as the latter define the trap spaces 161, 162 with the lateral walls 13. The controlling unit 25 includes a position detecting unit 2, a lock mechanism 4, and a drive unit 3. The position detecting unit 2 produces a first signal after the first door wing 12'

passes through the second position (2P), and includes a light sensor 22 mounted fixedly on the stationary seat 14 at a location corresponding to the second position (2P), and a plurality of reflector plates 23 mounted fixedly on the top plate 145 at locations corresponding to the positions of the door wings 12. The light sensor 22 senses a light signal when one of the reflector plates 23 moves past the second position (2P).

The lock mechanism 4 includes a first engaging portion 41 mounted on the stationary seat 14 at a location corresponding to the second position (2P), and a plurality of second engaging portions 44 disposed on the top plate 145 (see Figure 2) and arranged respectively at locations corresponding to the positions of the door wings 12. The first engaging portion 41 is interlockable with one of the second engaging portions 44. The first engaging portion 41 includes a first electromagnetic device 411 fixed on the cross frame 142 and having a magnetically-operated first plunger 412 mounted movably and vertically, and a first spring member 413 sleeved on the first plunger 412 to urge the first plunger 412 to move downwardly.

A disengaging unit is provided to stop the first engaging portion 41 from engaging the corresponding second engaging portion 44, and includes a second electromagnetic device 421 fixed on the cross frame 142 adjacent to the first electromagnetic device 411 and

having a magnetically-operated second plunger 422 mounted movably and horizontally, and a second spring member 423 sleeved on the second plunger 422 to urge the second plunger 422 toward the first plunger 412.

5 In this embodiment, each of the first and second spring members 413, 423 is a compression spring. Each second engaging portion 44 is formed as a hole in a top surface of the top plate 145. In this embodiment, there are four second engaging portions or holes 44, each of which is
10 aligned with a corresponding one of the door wings 12. The first plunger 412 is movable downwardly to engage one of the second engaging portions or holes 44 when the first and second door wings 12', 12" reach respectively the first and second positions (1P, 2P).

15 The drive unit 3 is coupled to the revolving door 1 and is further coupled to and controlled by the position detecting unit 2 to rotate the door wings 12 to a standby position (3P) (see Figure 2) before the first signal is produced by the position detecting unit 2. The drive
20 unit 3 includes a motor 311 fixed on the cross frame 142, and a transmission mechanism 312 interconnecting the shaft 11 and the motor 311. The transmission mechanism 312 includes a sprocket wheel and a chain. Alternatively, other types of transmission mechanisms 312 can be
25 suitably used in the present invention. The position detecting unit 2 produces a second signal prior to the first signal to stop the drive unit 3 when the first

door wing 12' moves past the second position (2P).

In normal situations, the drive unit 3, the position detecting unit 2, and the lock mechanism 4 of the controlling unit are deactivated. As the first and second 5 electromagnetic devices 411, 421 are not energized, the second spring member 423 urges the second plunger 422 toward the first plunger 412 so as to block a lower end of the first plunger 412, thereby preventing the first plunger 412 from moving downwardly, as best illustrated 10 in Figure 3. At this time, the lock mechanism 4 does not affect the rotation of the door wings 12.

Referring back to Figure 4, when the controlling unit is activated, the second electromagnetic device 421 is first energized so that the second plunger 422 is 15 magnetically retracted and moves away from the first plunger 412. At this time, through gravity and through the urging of the first spring member 413, the first plunger 412 can move downwardly, and initially abuts against the top surface of the top plate 145. When the 20 second door wing 12" rotates to the second position (2P), the hole or the second engaging portion 44 corresponding to the second door wing 12" and the first plunger 412 are aligned so that the first plunger 412 can advance downwardly to engage the hole 44 for retention therein, 25 as best shown in Figure 6. The door wings 12 stop rotation at this time, and a passerby 5, such as a robber, can be trapped within the trap space 162 (see Figure 5).

When a robbery occurs, a controller, such as a bank employee (not shown), may activate the controlling unit. In this situation, the motor 311 of the drive unit 3 is actuated so as to rotate the door wings 12. As soon 5 as the first door wing 12' moves past the second position (2P), a second signal is generated by the light sensor 22 of the position detecting unit 2 prior to the generation of the first signal to stop rotation of the motor 311. Due to inertial force, the first door wing 10 12' moves to the standby position (3P). At this moment, the light sensor 22 generates the first signal. In response to the first signal, the second electromagnetic device 421 is energized so that the second plunger 422 is magnetically retracted and moves away from the first 15 plunger 412, thereby permitting the first plunger 412 to move downward. When the robber 5 reaches the door wings 12, he will push forward the first door wing 12'. As soon as the second door wing 12" reaches the second position (2P), the first plunger 412 extends into the 20 hole 44 immediately therebelow, thereby locking the second door wing 12". At this time, the first door wing 12' stops at the first position (1P), and the second door wing 12" is positioned at the second position (2P).

All the door wings 12 are therefore prevented from 25 rotation at this moment, and the robber 5 is trapped within the trap space 162. To arrest the robber 5, the controller may reactivate the controlling unit so that

the first electromagnetic device 411 is energized to unlock the door wings 12. At this time, the first plunger 412 is removed from the corresponding hole 44, whereas the second electromagnetic device 421 is de-energized 5 so that the second plunger 422 is urged by the second spring member 423 to move toward and block the first plunger 412. The first door wing 12' can now be continuously rotated once again so as to permit removal of the robber 5 from the trap space 162.

10 From the aforementioned construction and operating method of the controlling unit, it is apparent that a specific passerby 5, such as the robber, can be trapped temporarily within the trap space 162, such that the robber is not only prevented from escaping, but is also 15 isolated from the people inside and outside of the premise so that the people are protected from harm. Thus, the present invention obtains a dual purpose. Moreover, the controlling unit can ensure that the passerby 5 will enter the trap space 162 and be limited therein.

20 While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included 25 within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.